Chapter Thirty-nine

TRAFFIC CONTROL DEVICES

BUREAU OF LOCAL ROADS AND STREETS MANUAL

Chapter Thirty-nine
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TRAFFIC CONTROL DEVICES

39-1 GENERAL

The purpose of traffic control devices, as well as the principles for their use, is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets and highways throughout the nation. Traffic control devices notify road users of regulations, and provide warning and guidance needed for the safe, uniform, and efficient operation of all elements of the traffic stream. The *Illinois Vehicle Code* (Sections 625 ILCS 5/11-303 and 304) establishes the responsibility for the erection and maintenance of traffic control devices on State highways and on local roads. Various other sections of Chapter 11 of the *Illinois Vehicle Code* deal with specific traffic regulations and control devices.

39-1.01 National Manual on Uniform Traffic Control Devices (*MUTCD*)

FHWA publishes the *MUTCD*, which contains all national design, application, and placement standards for traffic control devices. The *MUTCD* is adopted in accordance with Title 23, USC Section 109(d) and Title 23 CFR Part 655.603, and is approved as the national standard. This *Manual* contains the basic principles that govern the design and use of traffic control devices for all streets and highways open to public travel, regardless of type or class or the public agency having jurisdiction. All traffic control devices nationwide must conform to the *MUTCD*.

39-1.02 Illinois Manual on Uniform Traffic Control Devices (*ILMUTCD*)

States must adopt the *MUTCD,* along with any supplement that a State may require within two years of issuance by FHWA. The *Illinois Vehicle Code* (625 ILCS 5/11-301) authorizes the *ILMUTCD*. The *ILMUTCD* consists of the national *MUTCD,* including subsequent official revisions, as amended by the *Illinois Supplement to the MUTCD*. These publications are available on the IDOT website. In the interest of statewide uniformity, forward requests for interpretations, experimentation, and changes to the *ILMUTCD* to the IDOT Central Bureau of Operations.

The *ILMUTCD* is divided into parts covering various criteria applicable to all roads and streets. Part 5 specifically supplements and references the criteria for traffic control devices commonly used on low-volume roads. A low-volume road is considered to be outside built-up areas and has a traffic volume of less than 400 AADT.

39-1.03 *ILMUTCD* Text Headings

The *ILMUTCD* text is divided into four headings — standard, guidance, option, and support. Use the appropriate text to classify the nature of the information. The *ILMUTCD* defines these headings as follows:

1. Standard. A standard is a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. The designer must follow the provisions of a standard without exception or with exceptions so noted under the standard heading. Typical phrases include shall, shall mean, shall be satisfied, shall consist, etc.

2. Guidance. This heading is a statement of a recommended, but not mandatory, practice in typical situations. Deviations are allowed where engineering judgment indicates the deviations to be appropriate. The designer will follow these provisions with very few exceptions. For situations where it is impractical to follow "guidance" criteria, the designer must obtain IDOT approval of the deviation in accordance with the procedures in Chapter 27. Typical phrases include should, should be, should be considered, should be given, etc.

3. Option. This heading is a statement of practice that is a permissive condition, but carries no recommendations or requirement. The designer is free to use or refrain from their use. Typical phrases include may, may be used, may be considered, etc.

4. Support. This is an informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition.

39-2 HIGHWAY SIGNING

39-2.01 Purpose and Responsibilities

The purpose of signing on local agency roads and streets is to help ensure safety by providing for the orderly and predictable movement of motorized and non-motorized traffic throughout the local system, and to provide guidance and warnings as needed to ensure the safe and informed operation of the users of the system. Signs are essential to regulate and guide traffic over established routes, and to provide information concerning direction and destinations. Signs also are used to warn of hazards that are not evident and to call attention to special regulations and restrictions. To be effective, a highway sign should meet the following minimum requirements:

- fulfill a need;
- command attention;
- convey a clear, simple meaning;
- command respect of road users; and
- provide adequate time for proper response.

Section 39-2 provides guidance regarding the use of highway signs on local roads and streets, and the guidance provided must be used in conjunction with sound engineering judgment and the *ILMUTCD*. Traffic control devices must be in conformance with the *ILMUTCD* (625 ILCS 5/11-304). Placement of traffic control devices on township or road district roads is also subject to the written approval of the county engineer. Highway signing should be used only where warranted by facts and field studies. Failure to install and maintain proper signing on local highways and streets has resulted in liability suits involving municipality, county, and township employees, who are responsible for highways and highway signing. For additional information on highway signing material specifications, design, and application criteria, review the applicable publications listed in Section 39-6.

Economics frequently limit the ability to place all signs that may be needed. For this reason, it is important that roadway needs be inventoried, identified, and prioritized so that the needs can be fulfilled. Consider the following when establishing priorities:

- safety hazards and driver and pedestrian safety;
- number, severity, and cause of crashes;
- volume of traffic; and
- availability of finances, manpower, equipment, and materials.

39-2.02 General Design Principles

39-2.02(a) Driver Expectancy

Drivers expect things to operate in certain ways. When a driver's expectancy is incorrect, either it takes longer to respond properly or the driver may respond poorly or incorrectly. Driver expectancy is affected by the type and function of road and what the driver expects on a road is greatly influenced by what is experienced on the previous road section. The consistent use and placement of traffic control devices helps ensure driver expectancy.

39-2.02(b) Positive Guidance

Positive guidance is the concept that a driver can be given sufficient information where and when it is needed, and in a form that can be best used to avoid unsafe conditions. Positive guidance can be given to the driver through combinations of signs, hazard markers, "Safe Speed" advisory plates, and the view of the road ahead.

39-2.02(c) Consistency

Consistency relates to the "sameness" of the nature of the road from one section to another. Inconsistencies are sudden changes in the nature of the road. Physical improvements to the roadway are generally impractical. Consequently, signing is often used to warn the driver of the upcoming roadway inconsistency.

39-2.02(d) Location

Uniform placement of signs, although desirable, is not always practical, because roadway alignment and other factors often dictate a more advantageous location. When determining sign locations, consider the following:

1. Special Locations. Normally, signs should be placed on the right side of the roadway. Under certain circumstances, however, signs may be placed on channelizing islands or on the left side of the roadway along sharp, right-hand curves. These signs should supplement the right-hand signs.

2. Nighttime Visibility. Locate signs to optimize their nighttime visibility. Pay particular attention to the orientation angle of the sign face with respect to oncoming traffic.

3. Dual Signing. Single signing should be used unless a dual-signing configuration is warranted. Consider dual signing on one-way roadways (i.e., on both sides of the traveled way) for additional emphasis where a single sign may not provide adequate warning and where roadway geometry or other factors (e.g., multiple lanes, trucks, parked vehicles) may cause a single sign to be obscured.

4. Field Conditions. Adherence to desired placement is not always practical. Adjust sign locations to accommodate field conditions and try to avoid areas such as:

   a. at short sags in the roadway,

   b. beyond the crest of a vertical curve,

   c. where a sign would be obscured by parked cars,

   d. where a sign would create an obstruction for pedestrians or bicyclists,

   e. where a sign would obscure visibility of hazardous locations,

   f. where the visibility of a sign would be impaired by overhead illumination,

   g. where a sign would be vulnerable to roadside splatter, and/or

   h. at locations close to foliage where the sign face may be covered.

   In some cases, signs can be shifted longitudinally without compromising their intended purpose, which may improve visibility.

5. Sign Groups. In general, signs are mounted individually on supports. However, it may be necessary to erect a sign grouping (e.g., route markings). Consider wind loading and breakaway-post criteria when designing sign groups.

6. Advance Warning Signs. Warning signs are placed in advance of the conditions to which they apply. If the distances in the *ILMUTCD* cannot be met, consider other measures to attract the motorist's attention to the sign (e.g., flashing beacons, distance plates).

7. Roadside Safety. Signs should have the maximum practical lateral clearance from the edge of the traveled way to provide safety of motorists who may leave the roadway and strike the sign support. Supports for ground-mounted signs located within the clear zone must be made breakaway or yielding. Where practical, locate signs behind a roadside barrier that is warranted for other reasons. Provide adequate clearance to the back of the guardrail post to accommodate the barrier's dynamic deflection. In addition, do not place breakaway sign supports in drainage ditches where erosion and freezing might affect the proper operation of the support. It is also possible that an errant vehicle entering the ditch might be inadvertently guided into a sign support.

39-2.03 Maintenance Considerations

Highway signs should be maintained in proper position and be kept clean and legible. Damaged signs should be replaced as soon as practical. Poorly maintained signs lose their effectiveness, and signs that are damaged, defaced, dirty, or missing are ineffective. To ensure adequate maintenance and reduce the potential for litigation, a schedule of inspections should be established, including nighttime inspections. Local agency personnel should also observe

the signing on a daily basis as they drive the roads and streets for other purposes. Records of all signs, inspections, sign maintenance activities, and crashes should be maintained to help identify deficiencies. Pay particular attention to the following conditions:

- missing, damaged, obstructed, or hidden signs;
- absence of advanced warning signs, where needed (e.g., Stop Ahead, "T" intersection, railroads);
- signs placed at an improper height or angle; and
- sign faces that are worn or dirty with respect to reflectivity.

39-2.04 Sign Erection and Placement

Sign erection and placement criteria for highway signs are documented in the *ILMUTCD*. Additional guidance can be found in the BLRS publication, *Signing of Road District and Township Highways,* and the references listed in Section 39-6. The following is a summary of these criteria:

1. Height. Signs erected in rural areas should be mounted at a height of at least 5 ft (1.5 m) above the level of the pavement or roadway edge, measured to the bottom of the sign. In areas where there is parking, pedestrian traffic, or obstructions to view, the mounting height should be at least 7 ft (2.1 m) above the level of pavement or roadway edge. The height to the bottom of a secondary sign may be 1 ft (300 mm) less than these heights.

2. Lateral Clearance. The minimum offset of a sign should be 12 ft (3.6 m) from the edge of the traveled way to the near edge of the sign. If the shoulder is wider than 6 ft (3.6 m), the minimum offset should be 6 ft (1.8 m) from the edge of the shoulder. In urban areas, a lesser clearance may be used where necessary. Although 2 ft (600 mm) is the recommended minimum, in areas where sidewalk width is limited or where existing poles are close to the curb, a clearance of 1 ft (300 mm) is allowable.

3. Orientation. Signs should be vertically mounted at right angles to the direction of, and facing, the traffic that they are intended to serve. When mirror reflection from the sign face is encountered to such a degree as to reduce legibility, the sign should be turned slightly away from oncoming traffic at an angle of 2° to 5° greater than right angles. On curved alignments, the angle of placement should be determined by direction of approaching traffic rather than by the roadway edge at the point where the sign is located.

4. Posts and Mounting. Sign posts, foundations, and mountings must be constructed to hold signs in a proper and permanent position, and to resist swaying in the wind or removal by vandalism. A single post may be used for the erection of up to 24 in (600 mm) diamond shaped signs, signs with a horizontal dimension of 30 in (750 mm) or less, and individual signs with areas of 6.25 ft^2 (0.58 m^2) or less. All posts should be

breakaway. A double post installation should be used for signs, which are larger. The following are acceptable types of sign posts:

- tubular steel posts;
- telescoping steel posts no greater than 2 ¼ in by 2 ¼ in (57 mm by 57 mm);
- U-channel posts;
- 4 in by 4 in (100 mm by 100 mm) wood posts; and
- 4 in by 6 in (100 mm by 150 mm) wood post with the 6 in (150 mm) side parallel to the roadway with appropriately drilled holes to ensure that the post is breakaway.

In urban areas, it may be convenient to band or otherwise fasten signs to existing utility or light poles, with the approval of the appropriate utility company.

39-2.05 Retroreflectivity and Illumination

Regulatory, warning, and guide signs are required to be retroreflective or illuminated to show the same shape and similar color by both day and night, unless specifically stated otherwise in the *ILMUTCD*. Retroreflectivity may be accomplished by means of:

- reflector buttons or similar units set into the symbol, word message, and border; or
- a material that has a smooth, sealed outer surface over a microstructure that reflects light for the symbol, word message, border, and background.

Illumination may be accomplished by means of:

- a light behind the sign face, illuminating the word message or symbol, and the sign background, or all three through a translucent material;
- an attached or independently mounted light source designed to direct essential uniform illumination over the entire face of the sign;
- light emitting diodes (LED) for the symbol or word message and portion of the sign border; or
- some other effective device (e.g., luminous tubing or fiber optics shaped to the lettering or symbol, patterns of incandescent light bulbs, luminescent panels that will make the sign clearly visible at night).

39-2.06 Regulatory Signs

39-2.06(a) General

Regulatory signs inform highway users of traffic laws or other regulations and indicate the applicability of legal requirements. These signs are to be installed at or near those locations where the regulations apply and must be installed to provide adequate visibility and legibility in order to obtain compliance. All regulatory signs should be retroreflective or illuminated, consistent with current retroreflectivity standards. Signing criteria (e.g., dimensions, legend, shape, color, and placement) for various road classes and speeds are documented in the *ILMUTCD* and the BLRS publication *Signing of Road District and Township Highways*.

39-2.06(b) Stop Signs

Section 625 ILCS 5/11-302 grants local authorities and road district highway commissioners the authority to designate any street or highway under their jurisdiction as a through highway, and to require all vehicles to stop or yield before entering or crossing the through highway. STOP (R1-1) signs should be used if engineering judgment indicates that one or more of the following conditions exist:

- at an intersection of a less important road with a main road where application of the normal right-of-way rule would not be expected to provide reasonable compliance with the law;
- on a street entering a through highway or street;
- at an unsignalized intersection in a signalized area; or
- at an intersection where a combination of high speed, restricted view, or crash records indicate a need for control by a STOP sign.

Where a full stop is not necessary at all times, give consideration to less restrictive measures (e.g., YIELD sign) before installing a STOP sign. Existing STOP sign locations should be reviewed periodically to determine whether, due to changed conditions, a less restrictive control could accommodate the traffic demands safely and more effectively.

STOP signs should not be used for speed control. Portable STOP signs shall not be used except for in emergency situations and temporary traffic control purposes.

39-2.06(c) Multiway Stop Signs

The decision to install multiway stops should be based on an engineering study. The following criteria should be considered:

- as an interim measure where traffic signals are justified;

- 5 or more crashes in a 12 month period that are susceptible to correction by a multiway stop;
- the total vehicular volume entering an intersection from both major street approaches averages at least 300 vehicles per hour for any eight hours of an average day, and the combined total vehicular, bicycle, and pedestrian volume entering from both approaches of the minor street averages at least 200 units per hour for the same eight-hour period with an average delay of at least 30 seconds per vehicle on the minor approaches (70% of the above minimum vehicular volume warrants if the 85th percentile speed exceeds 40 mph (60 km/h)).

Other criteria discussed in the *ILMUTCD* may also be considered in an engineering study.

39-2.06(d) Yield Signs

The YIELD (R1-2) sign assigns right-of-way to traffic on certain approaches to an intersection. Vehicles controlled by a YIELD sign need to stop only when necessary to avoid interference with other traffic that is given the right-of-way. The YIELD sign may be erected at an entrance to an intersection instead of a STOP sign to give preference to traffic on a through street or highway designated in accordance with Section 625 ILCS 5/11-302. A YIELD sign may be used instead of a STOP sign if engineering judgment indicates that either of the following conditions exists:

- when the ability to see all potentially conflicting traffic is sufficient to allow a road user traveling at the regulatory speed to pass through the intersection or to stop in a reasonably safe manner, or
- at any intersection where a problem exists and where engineering judgment indicates the problem to be susceptible to correction by use of the YIELD sign.

39-2.06(e) Speed Limit Signs

Speed Limit (R2-1) signs are used to inform motorists of:

- the maximum statutory speed limit established in Section 625 ILCS 5/11-601, and
- of altered speed limits established on the basis of an appropriate engineering and traffic investigation in accordance with Section 625 ILCS 5/11-604.

Section 625 ILCS 5/11-604 empowers counties, municipalities, and park districts to establish speed limits on highways and streets for which they have maintenance responsibility. Counties also have this authority over township highways. The establishment of speed limits will be based on an engineering and traffic investigation in accordance with the criteria presented in the IDOT Bureau of Operations publication *Policy on Establishing and Posting Speed Limits*.

The following factors may be considered when determining speed limits:

- road surface characteristics, shoulder condition, grade, alignment, and sight distance;
- the 85th percentile speed and pace speed;
- roadside development and environment;
- parking practices and pedestrian activity; and
- reported crash experience for a recent 12 month period.

39-2.06(f) No-Passing Zones

The DO NOT PASS (R4-1) sign may be used at the beginning of, and at intervals within, a zone through which sight distance is restricted or where other conditions make overtaking and passing inappropriate. A NO PASSING ZONE (R14-3) sign may also be used on the left side of the roadway for additional emphasis. The PASS WITH CARE sign should be installed at the end of a no-passing zone if a DO NOT PASS sign has been installed.

39-2.06(g) Road Closed Signs

The ROAD CLOSED (R11-2) sign is used to mark roads closed to all traffic. A ROAD CLOSED – LOCAL TRAFFIC ONLY (R11-3) or ROAD CLOSED TO THROUGH TRAFFIC (R11-4) sign should be used where through traffic is not permitted or the closure is some distance beyond the sign, but the highway is open to local traffic up to the point of closure. These signs shall be preceded by the applicable Advanced Road Closed warning sign with the secondary legend AHEAD.

39-2.06(h) Weight Limit Signs

Weight limit signs are used on bridges and roadways where a weight restriction has been authorized. Section 625 ILCS 5/15-316 governs weight restrictions on roadways. A road district highway commissioner must obtain written approval from the county engineer prior to erection of weight restriction signs. The IDOT Local Bridge Unit establishes the numeric value of the maximum-posted weight for bridges.

39-2.06(i) Penalty for Dumping on Public Highways Signs

The use of the PENALTY FOR DUMPING ON PUBLIC HIGHWAYS sign is authorized by Section 605 ILCS 5/9-121. Consider its use only at locations where dumping is likely to occur. This sign should be located so as to provide the most efficient display of the message, either parallel or at a right angle to the pavement.

39-2.07 Warning Signs

39-2.07(a) General

Warning signs are used to alert traffic of existing or potentially hazardous conditions either on or adjacent to the roadway. Warning signs require caution on the part of the motorist and may call for an adjustment of speed or other maneuvers in the interest of their own safety and that of pedestrians and other motorists. The use of warning signs should be based on the results of an engineering study or engineering judgment.

Typical locations and conditions that may warrant the use of warning signs include:

- changes in horizontal alignment,
- intersections,
- advance warning of traffic control devices,
- converging traffic lanes,
- narrow roadways,
- changes in roadway design,
- steep grades,
- roadway surface conditions,
- in advance of railroad crossings,
- entrances and crossings,
- reduction in speed limits,
- no-passing zones, and
- road closures.

Because warning signs are primarily for the benefit of the driver who is unacquainted with the roadway, it is very important that care be given to the advance placement of these signs. The total time to perceive and complete a reaction to a sign is the sum of the times necessary for Perception, Identification (understanding), Emotion (decision-making), and Volition (execution of decision), and is commonly referred to as the PIEV time. The PIEV time can vary from several seconds for general warning signs, to 6 seconds or more where high judgment is required. See the *ILMUTCD* for the recommended minimum advance warning distances.

39-2.07(b) Horizontal Alignment Signs

Horizontal alignment Curve (W1-2) signs may be used where engineering investigations of roadway, geometric, and operating conditions indicate the advisory speed on the curve to be

greater than 30 mph (50 km/h), and equal to or less than the speed limit established for that section of highway. A horizontal alignment Turn (W1-1) sign may be used when the advisory speed of the curve is 30 mph (50 km/h) or less. The use of an Advisory Speed Plaque (W13-1) may also be used.

The One-Direction Large Arrow (W1-6) sign is intended to give notice of a sharp change of alignment in the direction of travel. Where justified, locate this sign on the outside of the turn or curve in line with and at right angles to approaching traffic.

The Chevron Alignment (W1-8) sign is intended to provide additional emphasis and guidance to motorists as to sharp changes of horizontal alignment. Where used, locate these signs on the outside of the curve or turn, in line with and at approximately a right angle to approaching traffic. Spacing of the signs should be so that the motorist always has two in view, until the change in alignment eliminates the need for the signs.

39-2.07(c) Intersection Warning Signs

Intersection Warning (W2-1 through W2-6) signs may be used in advance of an intersection to indicate the presence of an intersection and the possibility of turning or entering traffic and should illustrate or depict the general configuration of the intersecting roadway. Lines of different widths in the diagram may show the relative importance of the intersecting roads. The Cross Road (W2-1) and Side Road Symbol (W2-2 or W2-3) signs show side-road entering from the left and/or right and the angles of intersection. These signs should not generally be used on an approach where traffic is required to stop before entering the intersection. The “T” Symbol (W2-4) sign is intended to warn traffic approaching an intersection where the road ends at the intersection. It may be desirable to place a Two-Direction Large Arrow (W1-7) sign at the far side of the “T” in line with, and at approximately a right angle to, approaching traffic. A similar application of the “Y” Symbol sign applies to warning traffic approaching a “Y” intersection that the road continues in two directions.

39-2.07(d) Advanced Traffic Control Signs

The STOP AHEAD (W3-1), YIELD AHEAD (W3-2), or SIGNAL AHEAD (W3-3) sign shall be installed on an approach to a primary traffic control device that is not visible for sufficient distance to permit the driver to respond to the device. Obstructions causing limited visibility might include roadway alignment, structures, parked vehicles, and foliage.

STOP AHEAD signs on local roads that intersect with a State highway will normally be maintained by the local agency. In the event the local agency insists that IDOT maintain the signs, an agreement must be entered into with the appropriate district. The agreement will allow IDOT to maintain the signs, but will require that the local agency to perform all inspections and notify IDOT when maintenance is required. IDOT will not patrol the local agency’s roads and streets for the purpose of inspecting the STOP AHEAD signs.

39-2.07(e) Speed Reduction Signs

In rural areas, a SPEED ZONE AHEAD (W3-5) sign should be used to inform motorists of a reduced speed zone when engineering judgment indicates the need for advanced warning to comply with the posted speed limit ahead. These signs are not normally used in urban areas due to relatively low speeds.

39-2.07(f) Road Narrows Sign

A ROAD NARROWS (W5-1) sign should be used in advance of a transition in lane width of a 2-lane road to a width so that vehicles might not be able to pass safely without reducing speed.

39-2.07(g) Narrow Bridge Sign

The NARROW BRIDGE (W5-2) sign should be used in advance of a bridge or culvert having a clear two-way roadway width of 16 ft to 18 ft (4.9 m to 5.5 m) or any bridge or culvert having a roadway clearance less than the width of the approach pavement. Additional emphasis should be provided by the use of object markers or delineators on both sides of the approach roadway.

39-2.07(h) One Lane Bridge Sign

A ONE LANE BRIDGE (W5-3) sign should be used on two-way roadways in advance of bridges or culverts having a clear roadway width of less than 16 ft (4.9 m). A ONE LANE BRIDGE sign should also be used where commercial vehicles constitute a high proportion of the traffic or the alignment limits the sight distance on the approach to a structure having a clear roadway width of 18 ft (5.5 m) or less. Object markers or delineators should also be placed on both sides of the approach roadway.

39-2.07(i) Advisory Speed Plaques

The Advisory Speed (W13-1) Plaque may be used to supplement any warning sign to indicate the advisory speed for a condition. The Advisory Speed Plaque shall be used where an engineering study indicates a need to advise users of the advisory speed for a condition. The advisory speed may be the 85^{th} percentile speed, the speed corresponding to the 16° ball bank indicator, or a speed determined by an engineering study.

39-2.08 School Area Signs

Use the SCHOOL SPEED LIMIT IS 20 MPH ON SCHOOL DAYS WHEN CHILDREN ARE PRESENT sign to establish speed zones authorized under Section 625 ILCS 5/11-605. The speed zone should be used where elementary through high school buildings or grounds

devoted primarily to normal school day activities are adjacent to the highway, or where groups of children cross the highway enroute to and from a school not adjacent to the highway. Do not sign areas that are devoted primarily to athletic or other extracurricular activities as school speed zones. Place a SCHOOL SPEED ZONE AHEAD sign in advance of the first school speed limit sign where the posted speed limit in the area is greater than 30 mph. At the end of a posted school speed zone, the speed limit for the following section of highway shall be posted with the appropriate standard speed limit sign or with an END OF SCHOOL ZONE sign.

The School Crosswalk Warning assembly should be installed at marked crosswalks including signalized locations used by students going to and from school as determined by an engineering study. The School Crosswalk Warning assembly (S-1 with diagonal arrow) shall not be installed on approaches at crossings controlled by a STOP sign. Only crossings adjacent to schools and those on established school pedestrian routes can be signed. Where used, the sign will be erected at the crosswalk, or as close to it as practical.

The School Advance Warning assembly (S1-1 with supplemental plaque) should be used in advance of locations where school buildings or grounds are adjacent to the highway, except where a physical barrier (e.g., fencing) separates school children from the highway. The School Advance Warning assembly shall be used in advance of any installation of the School Crossing Warning assembly. If used, install the School Advance Warning assembly not less than 150 ft (45 m) nor more than 700 ft (210 m) in advance of the school grounds or school crossings.

39-2.09 Railroad Crossing Signs

The Highway-Rail Grade Crossing Advance Warning (W10-1) sign shall be installed in advance of all at-grade railroad crossings, except:

- on low-volume, low-speed roadways crossing minor spurs or other tracks that are infrequently used and that are flagged by members of the train crews;
- in business or residential districts where active highway-rail grade crossing traffic control devices are in use, or
- where physical conditions do not permit even a partially effective display of the sign.

In addition, if the distance between the railroad tracks and an intersection, measured from the edge of the tracks to edge of the parallel roadway, is less than 100 ft (30 m), install the Highway-Rail Crossing Advance Warning (W10-2, W10-3, or W10-4) signs on each approach of the highway that is parallel to the railroad. The purpose of these signs is to warn motorists turning at the intersection that a railroad crossing is ahead. A Railroad Crossing Advance Warning sign is not required on the approach to the crossing between the parallel highway and the tracks.

Install a XX FT BETWEEN TRACKS AND HIGHWAY Storage Distance sign on any approach to a railroad grade crossing where the distance between the rail closest to a subsequent STOP sign controlled highway intersection, and the intersection stop line is less than 81 ft (25 m). The distance shown is measured from a point 6 ft (1.8 m) from the rail closest to the intersection to

the stop line or crosswalk, whichever is closest, rounded down to the nearest 5 ft (1.5 m). Where there is no stop line or crosswalk, the measurement is from a point 5 ft (1.5 m) from the edge of the closest through traveled lane. Do not use these signs at traffic signal controlled intersections except as an interim measure at any location with an intersection traffic signal, which will be changed to near-side intersections signals on the approach side of the tracks at the grade crossing at a future time.

See the *ILMUTCD* and the BLRS publication, *Signing of Road District and Township Highways,* for design and placement details of Railroad Advance Warning signs.

39-2.10 Miscellaneous Signing

39-2.10(a) General

Guide signs are used to inform the motorist of intersecting routes, of cities, villages, or other important destinations, to identify nearby rivers and streams, parks, forests, and historical sites, and to give information that will help direct the motorist in the most simple, direct manner possible. Signs of this type, therefore, should be placed at locations where needed for driver guidance and direction. Once erected, it is essential that the guide sign be maintained.

The guide signs that are used most often on local agency roads are the destination, distance, and informational signs. These signs consist of a white message on a green background and must be retroreflective unless otherwise specified in the *ILMUTCD*. Unlike most other types of signs, guide signs do not lose their effectiveness with frequent use. These signs should not contain so much information or be so close together that the driver will lose the messages.

39-2.10(b) County Route Numbering System

County highways are assigned route numbers. A county may elect to install route marking signs on this system of highways.

39-2.10(c) Rural Reference System

The Rural Reference System is a voluntary system that provides for the development of uniform reference points on rural county and township roads. Use of the Rural Reference System is recommended to provide orientation for non-local travelers and can also be used as a rural address program. With this system, traffic crashes can be located with an accuracy of 0.1 of a mile (0.16 km). Signs are usually placed at each intersection and provide the location within the county. The reference system coordinates may be combined with the road name on the signs.

39-2.10(d) Street Name Signs

Street name signs should be installed at all street intersections in urban areas and should be installed in rural areas to identify important roads. See the *ILMUTCD* for more details.

39-2.10(e) Tourist Oriented Business Signing

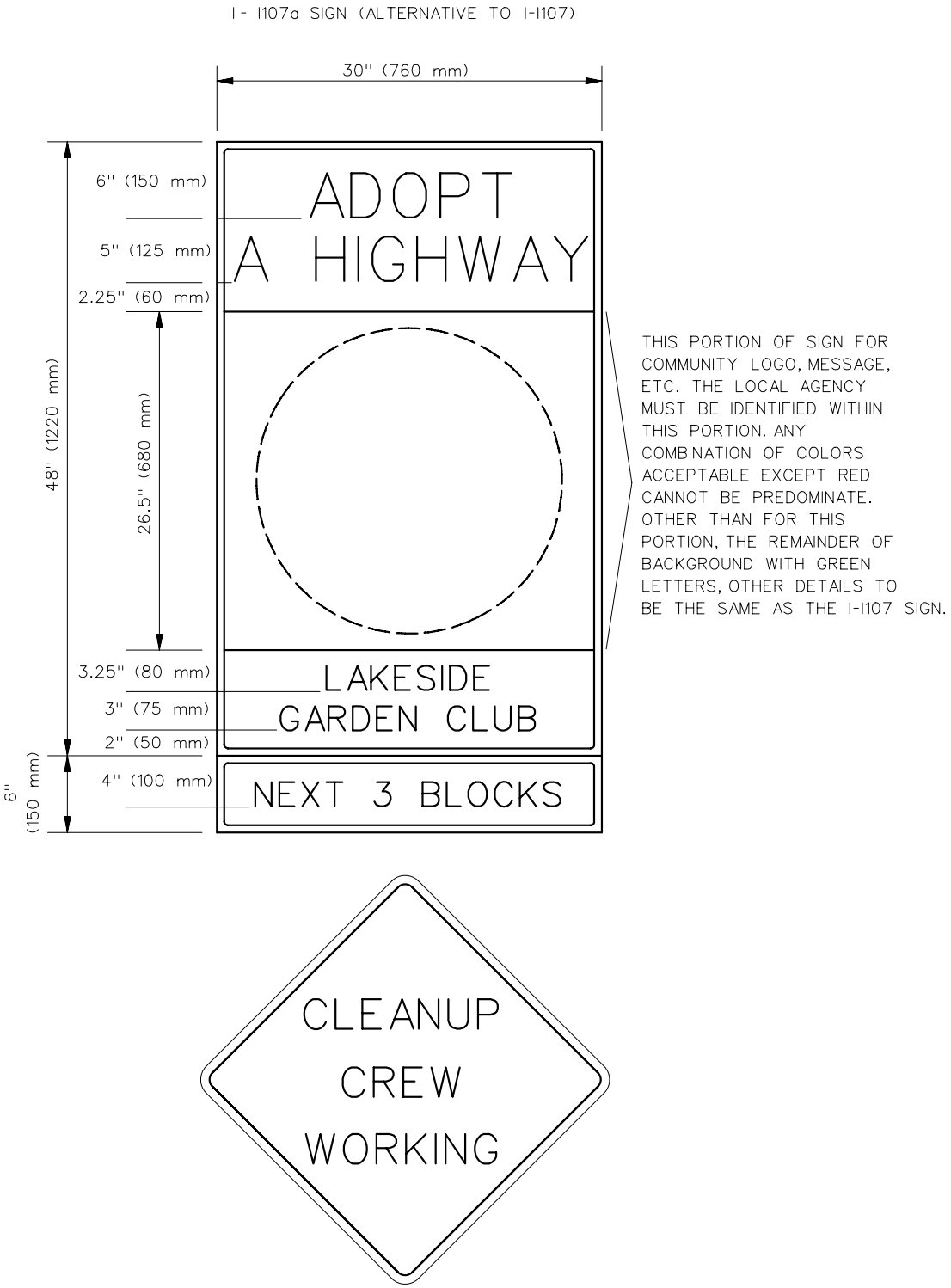
Section 625 ILCS 5/11-304 allows local agencies to install signs alerting motorists of tourist oriented businesses that are on roads in rural areas under local agency jurisdiction. The decision to place or allow signs on the local system rests with the local agency. Local agencies also have the authority to sell or lease space on these signs to the owners or operators of the businesses. Tourist oriented directional signs on highways under local agency jurisdiction must be in conformance with the *ILMUTCD*.

39-2.10(f) All-Terrain Vehicle (ATV) Signing

Local agencies may adopt ordinances or resolutions that permit all-terrain vehicles to operate on roads and/or bridges under their jurisdiction to access areas designated for use by these vehicles. IDOT has adopted signs to be used by local agencies to mark such routes. See the *ILMUTCD* for sign and placement details.

39-2.10(g) Adopt-a-Highway Signs

The sign shown in Figure 39-2A has been developed for use by local agencies for their respective Adopt-a-Highway program signs. It is not necessary for local agencies to seek IDOT approval for the logo or message to be used on this design.



ADOPT-A-HIGHWAY SIGN STANDARD

Figure 39-2A

39-3 MARKINGS

Markings on highways have important functions in providing guidance and information for the road user. Marking types include pavement and curb markings, object markers, delineators, barricades, and islands. Markings are used to convey regulations, guidance, or warnings in ways not obtainable by the use of other devices and to supplement other traffic control devices (e.g., signs, signals).

39-3.01 General Pavement Marking Guidelines

39-3.01(a) General

The designer is responsible to provide for the initial placement of pavement markings (e.g., striping, symbols) and the development of the pavement marking detail sheets for insertion into the plans. Prior to final acceptance of a completed roadway project, all pavement markings must be in place.

See the *ILMUTCD* and the publications listed in Section 39-6 for specific application criteria. The guidelines in the following Sections should be considered when developing pavement-marking details for roadway application.

39-3.01(b) Color

Most pavement markings will be either white or yellow conforming to the standard highway color specifications. For example, word and symbol markings, crosswalk lines, parking space lines, lines for lanes in the same direction, and the right edge lines are white. Lines separating lanes in the opposite direction, the left edge lines of divided and one-way roadways, and two-way left-turn lanes are yellow.

39-3.01(c) Orientation and Style

Pavement marking line types vary depending on their application. Line types will vary in thickness and width; they will be oriented in a longitudinal, transverse, or diagonal configuration. Longitudinal lines will be striped as either single or double lines in a solid, broken, or dotted pattern. The normal line is 4 in to 6 in (100 mm to 150 mm) wide. A wide line is at least twice the width of a normal line. A double line consists of two parallel lines separated by a discernible space and indicates maximum or special restrictions. A solid line discourages or prohibits vehicles from crossing. A broken line should consist of 10 ft (3 m) line segments and 30 ft (9 m) gaps. This indicates a permissive condition. A dotted line for line extensions may consist of 2 ft (600 mm) line segments with 2 ft (0.6m) to 6 ft (1.8 m) gaps. A dotted line for adding or dropping lanes may consist of 3 ft (1 m) line segments with 9 ft (2.7 m) gaps. A dotted line provides guidance to the driver.

39-3.01(d) Materials

Paint may be used at all locations to provide good year-round visibility. Longer-life permanent pavement markings may be used on rural and urban highways. Pavement markings normally will be reflectorized.

The following should be considered when selecting a permanent pavement marking material:

1. Epoxy. On PCC and bituminous concrete surfaces, epoxy materials may be used for longitudinal lines. This material is generally not suitable for symbols, letters, crosswalks, stop bars, and similar markings because of problems that develop with intermittent application.

2. Thermoplastic. On rural and urban highways with bituminous concrete surfaces, thermoplastic material may be used for longitudinal lines, symbols, letters, crosswalks, stop bars, and similar markings.

3. Preformed Plastic. Preformed pavement markings may be used on new surface construction under the following conditions:

    a. Local Agency Criteria. If the local agency has a policy for the use of preformed pavement marking on new asphalt, preformed pavement marking may be specified on any local agency project.

    b. Construction Work Zone. Preformed pavement marking may be specified on any inlay application, so that the final pavement will be in place when construction is finished.

    c. Concrete Surfaces. The local agency may specify the use of preformed pavement marking on new pavement in lieu of paint, epoxy, or thermoplastic.

4. Raised Reflective Pavement Markers. Permanent raised reflective pavement markers may be used in situations where it is desirable to supplement the standard pavement markings. Locations selected for installation of raised pavement markers should either be unlighted or lighted only to the extent that it would not cause the markers to be ineffective.

39-3.02 Longitudinal Pavement Markings

The following Sections present typical longitudinal pavement marking applications. Additional guidance for line size, color, and placement can be found in the *ILMUTCD.*

39-3.02(a) Centerlines

Centerlines are used to delineate the separation of traffic lanes for vehicles traveling in opposite directions. When used for two-lane, two-way highways, the centerline shall consist of a normal broken yellow line in two-direction passing zones. No-passing zones are discussed below. Two solid yellow lines for a centerline separation on two-way roadways with 4 or more travel lanes shall always be used.

Centerline markings should be placed on all paved streets. Centerline markings should also be placed on unpaved rural collectors 18 ft (5.4 m) or more in width with an ADT of 3,000 or greater.

39-3.02(b) No-Passing Zones

A no-passing zone is a special type of centerline marking. The centerline marking consists of two normal yellow lines. Where centerline markings are used, a solid yellow line adjacent to the lanes that warrant the no-passing restriction shall be placed

Where the centerline is striped, no-passing lines shall be used on the approaches to highway-railroad crossings. Also, no passing zones should be established at vertical and horizontal curves and elsewhere on 2-lane facilities where an engineering study indicates that passing should be prohibited because of limited sight distance or other special conditions. Minimum passing sight distances are provided in the *ILMUTCD.* The values presented in the *ILMUTCD* should not be confused with the passing sight distances presented in Chapter 28. The values presented in Chapter 28 are geometric design criteria based on an assumption that a passing vehicle will be able to complete its passing maneuver. The minimum passing sight distance criteria presented in the *ILMUTCD* are sufficient to allow a passing vehicle to abort its passing maneuver. Where the distance between no-passing zones is less than 400 ft (120m), no-passing markings should connect the zones.

39-3.02(c) Lane Lines

Lane lines are used to delineate the separation of two or more lanes of traffic traveling in the same direction. When used, the lane line will usually consist of a normal broken white line. A solid white line may be used to discourage lane switching (e.g., approaches to signalized intersections).

Lane lines should be used on all paved highways with two or more traffic lanes for travel in the same direction.

39-3.02(d) Edge Lines

Edge lines are used to delineate the edge of traveled way. Left-hand edge lines are median lines, except on one-way streets. If used, the right-hand edge line shall consist of a solid white line. The left-hand edge line of divided and one-way pavements and along medians shall consist of a solid yellow line.

Edge lines should be placed on paved highways that have an ADT greater than 1,000. They may be excluded based on engineering judgment if a curb delineates the travel way.

39-3.02(e) Median Markings

If a median island separating travel in the opposite direction is formed by pavement markings, the median should be outlined by a double set of solid yellow lines on each edge of the median.

39-3.02(f) Two-Way Left Turn Lanes

The pavement edge along each side of a two-way left turn lane shall consist of a normal broken yellow line and a normal solid yellow line with the solid line adjacent to the through lane.

39-3.02(g) Transitions

Where transitions are necessary, pavement markings are used to guide the motorist through the transition area. See the *ILMUTCD* for the applicable taper rate and length criteria at transitions.

39-3.03 Intersections

The following Sections present typical intersection pavement marking applications. See the *ILMUTCD* for line size, color, and placement guidelines.

39-3.03(a) Stop Lines

The stop line is a transverse line that is used to indicate where the desired vehicular stopping point is located. A stop line is a solid white line 12 in to 24 in (300 mm to 600 mm) wide provided across the approach lanes. The location of the stop line may be adjusted to fit field conditions. For example, where turning trucks are known to encroach into the opposing lane, the stop line should be placed outside the area of frequent encroachment. On multilane facilities that intersect the crossroad at an angle, it may be appropriate to stagger the stop line for each lane. This consideration is especially important at signalized intersections, which may have substantial clearance times. In the absence of a marked crosswalk, stop lines should not be placed more than 30 ft (9 m) or less than 4 ft (1.2 m) from the nearest edge of the of the intersecting travel way.

39-3.03(b) Crosswalks

Marked crosswalks provide guidance to pedestrians crossing roadways at intersections with traffic signal and stop signs. Marked crosswalks also serve to alert road users of a pedestrian crossing point at other locations. Crosswalks are usually marked with transverse solid white lines between 6 in and 24 in (150 mm and 600 mm) wide. The distance between the lines should not be less than 6 ft (1.8 m).

Crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements and other appropriate points of pedestrian concentration. An engineering study should be used to determine the need for crosswalks at locations away from highway traffic signals or STOP signs (e.g., midblock locations).

39-3.03(c) Lane-Use Control Markings

At multilane approaches to intersections, it is often necessary to mark the intersection approach to designate the permitted movements through the intersection. This is especially important at intersections that have complex geometrics and multi-phase signal operations (e.g., exclusive turn lanes, drop lanes, dual left-turn lanes). The markings consist of white words and/or symbols. Where through traffic lanes approaching an intersection become a mandatory turn lane, lane-use arrow markings shall be used and shall be accompanied by standard signs. Also, consider using lane-use control markings in the following locations:

- turn bays,
- approach lanes at major signalized intersections, and
- where an abnormal traffic pattern exists at an intersection approach.

39-3.03(d) Multiple Turn Lanes

At intersections that have multiple turn lanes (e.g., dual left-turn lanes), a series of single dotted lines may be used to guide the turning traffic through the intersection. These lines are white and are typically an extension of the lane line. The radius of the dotted line as extended through the intersection should be sufficient to accommodate the turning radius of the design vehicle.

39-3.04 Miscellaneous Marking Applications

39-3.04(a) School Areas

Pavement markings through school areas should be placed according to the criteria presented in the *ILMUTCD*. See the publications in Section 39-6 for additional criteria. Pavement

markings for school crossings should be used only with the appropriate signing. Marked crosswalks should be placed at designated school crossings. The word SCHOOL may extend to the width of two approach traffic lanes.

39-3.04(b) Highway-Rail Grade Crossings

Pavement markings in advance of highway-rail grade crossings shall be placed according to the criteria presented in the *ILMUTCD*. All crossing pavement markings shall be retroreflectorized white and shall consist of an X, the letters RR, and certain traverse lines. See the publications in Section 39-6 for additional design and application guidance. Pavement markings at railroad crossing approaches are not required:

- where the prevailing speed is less than 40 mph (60 km/h),
- in urban areas where an engineering study indicates that other devices can be installed to provide suitable warning and control, and
- where the pavement is a low-type material.

No passing zones at railroad crossings are discussed in Section 39-3.02(b).

39-3.04(c) On-Street Parking

Marking of parking space boundaries encourages more orderly and efficient use of parking. Where used, on-street parking should be marked a sufficient distance back from an intersection so as not to obscure, or otherwise diminish, sight distance at the intersection and to minimize interference with the flow of vehicles and pedestrians. Curb markings may be used to delineate no parking areas. Local highway agencies may prescribe the color of the marking. The publications in Section 39-6 provide additional guidance for on-street parking.

39-3.04(d) Bike Facilities

All markings used on bikeways shall be retroreflectorized. Longitudinal lines should be used to define bicycle lanes on roads and streets. If the bicycle lane symbol is used, it shall be placed immediately after an intersection and at other locations as needed.

Where shared-use paths are of sufficient width to designate two minimum width lanes, a solid yellow line may be used to separate the two directions of travel where passing is not permitted, and a broken yellow line may be used where passing is permitted. A solid white line may be used on shared-use paths to separate different types of users. The *ILMUTCD* provides additional detail concerning the marking of bikeways.

39-3.04(e) Truck-Climbing Lanes

A solid white lane line may be placed between the normal travel lane and the truck-climbing lane. Transition the edge line to the outside edge of the climbing lane.

39-3.05 Object Markers

The use of object markers is intended to identify specific objects (e.g., bridge handrails, abutments, culvert headwalls) wherever the object is located either within or adjacent to the roadway. Obstructions within the roadway shall be marked with a Type 1 or Type 3 object marker. In addition to markers on the face of the obstruction, warning of approach to the obstruction shall be given by appropriate pavement markings. Objects not actually in the roadway are sometimes so close to the edge of the road that they need a marker. If used, the inside edge of the marker shall be in line with the inner edge of the obstruction. The Type 3 object marker is the marker most frequently used on rural roads.

39-4 TRAFFIC SIGNALS

39-4.01 General

A traffic signal is a valuable device for the control of vehicular and pedestrian traffic. Traffic signals assign the right-of-way to the various traffic movements by alternately directing which traffic is to stop and which traffic is to proceed. Traffic signals that are properly located, designed, and operated have the following advantages:

- provide for the orderly movement,
- increase traffic-handling capacity of an intersection,
- reduce frequency and severity of certain type collisions,
- coordinates the near continuous movement of traffic along a given route, and
- interrupts heavy traffic at intervals to allow other traffic to cross.

For information on traffic signal equipment and material specifications, design, and application criteria, review the applicable publications listed in Section 39-6.

39-4.02 Traffic Signal Needs Study

An engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location must be performed to determine whether installation of a traffic signal is justified at a particular location. A traffic signal should not be installed unless an engineering study indicates that installing the device will improve the overall safety and/or operation of the intersection.

39-4.02(a) Signal Warrants

The investigation of the need for a traffic signal includes an analysis of the applicable factors of the traffic signal warrants contained in the *ILMUTCD*. Information should be obtained by means of engineering studies and compared to the requirements of the warrants. For the purpose of comparing intersection conditions to the warrants, lanes added on major streets within 300 ft (90 m) of the intersection should not be considered as approach lanes unless a significant volume of traffic enters the streets within the added lane (e.g., ramp connection). If none of the warrants are satisfied, then a traffic signal should not be considered at the study location. Furthermore, the satisfaction of one or more of the warrants does not in itself justify the installation of a traffic signal.

39-4.02(b) Other Factors

Although one or more of the warrants presented in *ILMUTCD* may be satisfied, the results of a thorough engineering and traffic study of the site's physical characteristics and traffic conditions may indicate that the installation of a traffic signal is not the most prudent choice. In addition to the *ILMUTCD* traffic signal warrants, the following factors should be considered:

1. Crash Experience. Consider alternative solutions to crash-related problems (e.g., improving sight distance, using advance warning signs or larger signs).

2. Geometrics. The intersection's geometric design can affect the efficiency of the traffic signal. Traffic signal installations at poorly aligned intersections may, in some cases, increase driver confusion and reduce the overall efficiency of the intersection. When practical, properly align the intersection to adequately accommodate turning lanes, through lanes, etc.

3. Costs. The installation and maintenance of traffic signals can be very expensive. A cost-effectiveness analysis may be necessary to determine if the benefits from the reduction in crashes and delays will exceed the costs associated with signalization.

4. Location. Consider the intersection relative to the adjacent land use type and density (e.g., urban, suburban, rural) and the potential for future development in the study area. Also, consider the location of the intersection within the context of the overall transportation system (e.g., isolated locations, interrelated operations, functional classification). Normally, isolated locations are intersections where the distance to the nearest signalized intersection or potential future signalized intersection is greater than 0.5 mile (800 m).

5. Provisions for Future Installations. Consider the future needs of the study location. Assess the anticipated traffic growth and future operational requirements of the signalized location during planning and design, as practical, so that later modifications can be readily incorporated and total labor and material costs minimized. Traffic signal equipment should be specified with some degree of operational flexibility to accommodate future needs. This is illustrated by the following examples:

    a. Turn Lanes. If predicted traffic growth is likely to require a left-turn lane in the future, the design should accommodate this future need (e.g., equipment, phasing, circuitry, pole mounting).

    b. Street Widening. If a street will be widened or an intersection will be reconstructed in the foreseeable future, consider either a temporary signal or, if possible, an installation that conforms to the proposed final layout.

    c. Interconnection. If a need for signal interconnects or additional phases is foreseen, provisions for these situations should be incorporated in the initial design.

39-4.03 Existing Traffic Signals

If it is obvious that an existing traffic signal meets one or more of the traffic signal warrants, no special documentation will be required to allow the existing signals to remain or be modernized. Otherwise, the existing signals should be removed or retained based on the following, as well as other supporting information:

- percent of warrants met,
- expected development and traffic growth on intersecting streets,
- signal progression with adjacent signals, and
- crash potential due to either retention or removal of the signal.

Every reasonable effort should be made to remove unwarranted signals. However, upon presentation of evidence of strong local objections to removing existing signals and an indication, based on traffic engineering judgment, that they present no unusual safety hazards, the signal may be allowed to remain. All remaining signals will be upgraded, as needed, to conform to the *ILMUTCD*.

39-4.04 Pedestrian and School Crossing Signals

A pedestrian crossing signal may be necessary when the traffic volume on the major street is so heavy that pedestrians experience excessive delay in crossing the major street. A school-crossing signal may be installed when the school crossing warrant is met. Before a school-crossing signal is installed, consideration shall be given to implementation of other remedial measures (e.g., school speed zones, crossing guards). The pedestrian volume and school crossing warrants shall not be applied where the distance to the nearest traffic signal along the major street is less than 300 ft (90 m).

At an intersection, the traffic signal should be traffic-actuated and should include pedestrian detectors. At a non-intersection crossing, the traffic signal should be pedestrian actuated.

39-4.05 Signals Near Highway-Railroad Crossings

39-4.05(a) General

Where a signalized intersection is located within 200 ft (60 m) of a railroad grade crossing or where traffic frequently queues onto the tracks, the normal sequence of the traffic signals should be preempted by the approach of trains to avoid entrapment of vehicles on the crossings. The primary focus of the design of intersections where a railroad grade crossing is within 200 ft (60 m) should be to provide adequate storage area for vehicles between the track and intersection and to keep vehicles from stopping on the tracks while waiting for a green signal at the intersection. It may not be necessary to follow all of the recommendations contained in this

section at crossings where train speeds are low (i.e., 10 mph (15 km/h)) or where train movements are infrequent. The railroad operations at these crossings must be confirmed in writing by the railroad before any exceptions to these guidelines are considered.

39-4.05(b) Traffic Signal Design

Locations where traffic signal and railroad flashing-light signal systems are interconnected should be designed differently than the typical intersection. The two signal systems must be designed to operate together to provide a safe system for both the highway users and the railroads. Consider the following:

1. Preemption. Railroad preemption shall have priority over all other types of preemption in the traffic signal controller.

2. Clearance. When the signal is received from the railroad control equipment, the traffic signal controller shall terminate, using the normal clearance intervals, all phases that conflict with the track clear green phase. Any walk or pedestrian clearance intervals in effect when preemption is initiated should be immediately terminated. The pedestrian clearance may be run concurrently with the vehicular clearance interval for the cross street. However, do not extend the time needed to the cycle for the track clear green phase.

3. Signal Heads. Four or five section signal heads should be installed to allow for a protected left-turn phase on the track approach leg of the intersection during the preemption sequence.

39-4.05(c) Pre-Signal

A traffic signal may be required in advanced of the railroad crossing. The following criteria apply to this pre-signal:

1. Need. Pre-signal traffic signal heads should be placed on the near side of the rails to stop vehicular traffic before the railroad crossing at all signalized intersections if the clear storage distance, measured from the stop line to a point 6 ft (1.8 m) from the rail nearest the intersection, is 50 ft (15 m) or less. At all approaches where the crossing is on a state highway or where there are high percentages of multi-unit vehicles, the distance should be increased to 75 ft (23 m).

2. Signal Mounting. Traffic signal heads located on the near side of the tracks should be mounted on the railroad signal structure, if available, or as close to the crossing as practical without restricting visibility of the railroad signs and signals. The use of the railroad structure requires the concurrence of the railroad company and the ICC.

3. Signal Phasing. Where pre-signals are used, signal phase sequencing should be designed to avoid left-turning vehicles from being trapped either in the area between the intersection and the crossing, or in the intersection.

4. Timed Overlap. A timed overlap must be used to terminate the pre-signal before the far side intersection signal to clear the storage area between the tracks and the intersection with each cycle of the normal traffic signal operation. Vehicles that are required to make a mandatory stop (e.g., school buses, vehicles hauling hazardous materials) must be considered when determining the amount of time for the overlap to ensure they will not be forced to stop in the storage area.

5. Median. If pre-signals are needed on the near side of the tracks, a raised-curb median may be necessary adjacent to the tracks to provide for proper placement of signals.

39-4.05(d) Minimum Preemption Time

The minimum preemption time at the interconnected crossings consists of the following three components:

1. Right-of-Way Maximum Time. This is the maximum worst-case time that it will take for the traffic signal to clear to a green light for the track approach. It is IDOT's policy to get to this green as quickly as possible by immediately terminating any pedestrian WALK indications, abbreviating the pedestrian clearance interval, and running it concurrently with the vehicular clearance phase on the cross street. Local agencies should be aware of this abbreviated time to ensure that it does not conflict with designated school routes or other conditions. This time will include a 1 second delay upon receiving the signal from the railroad to limit the number of false calls received, a 1 second minimum green for the through movement, the amber clearance, and any all red time included in the timing sequence.

2. Queue Clear Time. The queue clear green time is the amount of time required to clear a vehicle that is just beyond the tracks to a point either completely through the intersection, for storage areas less than 50 ft (15 m) or to a point where the rear of the vehicle is 6 ft (1.8 m) from the near rail for longer storage areas. This time should be determined by field observations.

3. Separation Time. A separation time is added to ensure that a vehicle is not just clearing the tracks as the train enters the crossing. This is important to keep both the motorist and the train engineer from taking emergency actions. This time has been fixed at 9 seconds.

For additional information on preempting, contact the IDOT Central Bureau of Operations.

39-4.05(e) Coordination

Any proposed changes involving crossings that are interconnected with nearby traffic signal will be subject to the approval of the Illinois Commerce Commission (ICC). Additionally, any new signal that will require an interconnect with railroad flashing-light signals will also be subject to the review and approval of the ICC. Close coordination between the local agency, Central BLRS, the railroad company, and the Illinois Commerce Commission (ICC) is required to ensure the railroad flashing-light signals and the traffic signals are performing as a system. For intersections of two local streets, the ICC will be lead agency in coordinating between all parties involved. The IDOT Central Bureau of Operations will be responsible for reviewing the traffic signal design at intersections involving State highways and will submit it to the ICC for approval.

39-4.06 Traffic Detectors

The efficient operation of a traffic-actuated signal installation depends greatly upon the proper design and placement of traffic detectors. The primary purpose of a traffic detector is to detect the presence of a motor vehicle, bicycle, or pedestrian. There are many types of detector devices acceptable for use on a local highway project. These include the inductive loop detector, the preformed loop detector, the video image detector, and pedestrian push-button detector.

39-4.07 Signal Coordination

As traffic volumes increase, installing coordinated signal systems is an important consideration for improving traffic flow. By coordinating two or more traffic signals together, the overall capacity of the facility can be increased significantly. Generally, traffic signals that are within 0.5 mile (800 m) of each other are good coordination candidates. There are several different methodologies available to coordinate traffic signals.

39-4.08 Emergency Vehicle Preemption

An emergency vehicle preemption control may be provided to promptly display a green signal indication at signalized locations ahead of fire vehicles, law enforcement vehicles, ambulances, and other official emergency vehicles. IDOT approval must be obtained before the preemption control is provided at an intersection with a State highway.

39-4.09 Inspection and Maintenance Considerations

Local agencies should routinely inspect painted steel mast arm poles to determine the extent of corrosion loss and presence of any defects (e.g., cracks, impact damage) that would affect adequacy or longevity. These inspections should consist of the following:

4. Visual Checks. Check for perforations for severe corrosion on the column in the splash zone area, vehicle damage cracks in welds, concrete/grout deterioration, anchor bolt/nut condition, and pole interior condition, if hand holes allow access.

5. Sounding with Hammer. Use a hammer to sound unperforated poles in the splash zone areas, especially near the weld connections. A welder's chipping hammer with round edges or a small ball peen hammer should be used. This will help prevent causing any nicks or dents on the pole that could develop stress risers.

6. Ultrasonic Testing. Use a hand-held ultrasonic thickness gauge (e.g., DM-2) to determine variations in the pole's thickness.

Any significant corrosion loss or structural defects should be corrected immediately.

39-5 TEMPORARY TRAFFIC CONTROL

39-5.01 General

Traffic control in work zones will be provided in accordance with the *ILMUTCD*. The *ILMUTCD*, *BDE Manual,* the *Highway Standards*, and the IDOT Bureau of Operations publication, *Quality Standard for Work Zone Traffic Control Devices* contain traffic control devices and applications for work zones that are approved for use on local agency projects. For additional information on temporary traffic control material specifications, design, and application criteria, review the applicable publications listed in Section 39-6.

39-5.02 Terminology

The following definitions are used to define the time length for work zones:

1. Long-Term Stationary Work Zone. A construction, maintenance, or utility work site that requires traffic control in the same location and where the activity requires longer than 3 days.

2. Intermediate-Term Stationary Work Zone. A construction, maintenance, or utility work site that requires traffic control in the same location and occupies a location from overnight to 3 days.

3. Short-Term Stationary Work Zone. A construction, maintenance, or utility work site that requires traffic control in the same location and where the activity takes from 1 to 12 hours.

4. Short-Duration Work Zone. A construction, maintenance, or utility work site that occupies a location up to 1 hour.

5. Mobile Work Zone. A construction, maintenance, or utility work site that is continuously moving during the period when work is actively in progress.

39-5.03 Work Zone Traffic Control Strategies

39-5.03(a) Objectives

The desired objectives to consider in relocating traffic flow are:

- Remove traffic from the work site. This option usually reduces the construction costs and enhances safety. With this option, sufficient space should be available for the contractor to perform the work with reasonable economy and safety.
- Avoid unreasonable adverse travel and public inconvenience.

- Ensure that only reasonable delays will be caused for emergency vehicles, school buses, mail carriers, etc.
- Maintain reasonable access for local interests (residents, businesses, agriculture, etc.).

39-5.03(b) Work Zone Types

Except for roadway shifts, work sites that are completely off the roadway and do not disrupt traffic are not addressed because they will generally not have a major effect on traffic. The most common projects involving traffic flow through or around a work site include:

- bridge reconstruction, rehabilitation, or replacement;
- major pavement rehabilitation of existing highways;
- pavement removal and replacement;
- horizontal alignment change; and
- vertical alignment change.

The main function of temporary traffic control is to "relocate traffic flow" so that the construction work can proceed with minimum interruption and hazard to the workers and to the motorists.

The following presents a description for several work zone applications:

1. Lane Constriction. This work zone type is configured by reducing the width of one or more lanes to retain the number of lanes normally available to traffic. This application is the least disruptive of all work zone types, but it is generally only appropriate if the work area is mostly outside the normal traffic lanes. Note that narrow lane widths may reduce the facility's capacity, especially where there is significant truck traffic. The use of shoulders as part of the lane width helps reduce the amount of lane width reduction that may be required; however, check the structural adequacy of the shoulders. Where this application is applied to long-term work zones, it will require the removal of the current lane markings to avoid motorist confusion.

2. Lane Closure. This work zone type closes off one or more normal traffic lanes. Capacity and delay analyses may be required to determine whether serious congestion will result from lane closures. In some cases, use of the shoulder or median area as a temporary lane will help mitigate the problems arising from the loss in capacity. Upgrading or replacement of an existing pavement or shoulder, or placement of temporary pavement, may be necessary.

3. One-Lane, Two-Way Operation. This work zone type involves using one lane for both directions of traffic. This work zone type is typically only used on bridges or small, short-term projects. Flaggers or traffic signals are normally used to coordinate the two directions of traffic.

4. Runaround. This work zone involves the total closure of the roadway (one or both directions) where work is being performed and the traffic is rerouted to a temporary roadway constructed within the highway right-of-way. This application may require the acquisition of a temporary construction easement and usually requires extensive preparation of the temporary roadway. Generally, temporary runarounds are designed for a posted speed reduction of no more than 5 mph to 15 mph below the existing posted speed of the route.

5. Intermittent Closure. This work zone type involves stopping all traffic in one or both directions for a relatively short period to allow the work to proceed. After a specific time, depending on traffic volumes, the roadway is reopened and all vehicles can travel through the area. This application is normally only appropriate on low-volume roadways or during periods where there are very low volumes (e.g., Sunday morning, nighttime).

6. Use of Shoulder or Median. This work zone type involves using the shoulder or the median as a temporary traffic lane. To use this technique for more than a short period, it will be necessary to evaluate the shoulder and subgrade to verify its adequacy to support the anticipated traffic loads. This technique may be used in combination with other work zone types or as a separate technique.

7. Detour. This work zone type involves total closure of the roadway, in one or both directions, when work is being performed, and rerouting the traffic to existing alternative facilities. This application is particularly desirable when there is unused capacity on roads running parallel to the closed roadway. When considering detours, evaluate the following:

    a. Nearby Route Detours. A nearby local route may require upgrading (structurally and/or geometrically) or extraordinary maintenance to carry the anticipated temporary increase in traffic and to restore it subsequent to the detour. When investigating the practical use of a nearby facility as a detour route, note that the detour route will only be temporarily serving the through traffic. If the nearby route detour will be an economically reasonable alternative, make every effort to use the existing roadway width, the existing right-of-way, and to minimize any utility adjustments. Also, investigate the nearby route to determine the safe detour speed. Additional speed signs and warning devices may be required. Contact other agencies (e.g., State, county, municipalities) having jurisdiction over the nearby route and obtain their concurrence prior to using the route for a temporary detour. Also, contact emergency services, post offices, and public transportation agencies that may be affected by a road closure/detour.

    b. Location. The beginning and end of all detours should coincide as near as possible with the beginning and end of the construction project. Where practical, avoid long detours that will bypass entire communities.

c. Pedestrians. Evaluate pedestrian traffic concerns and methods of eliminating or minimizing any other adverse effects when closing a road. Adverse effects could include inadequate access to buildings, private property, or businesses along the closed road.

d. Railroad Crossings. Examine railroad crossings to see if existing protective devices, sight distances, geometrics, and crossing surfaces are adequate for the detoured traffic.

e. Wide Load Restrictions. Determine if there will be a need to post advance signs to prohibit wide loads from using the detour.

f. Benefits. Note that improvements to nearby routes provide a permanent benefit for the public, whereas runarounds provide only temporary benefits that cease when the construction project is completed.

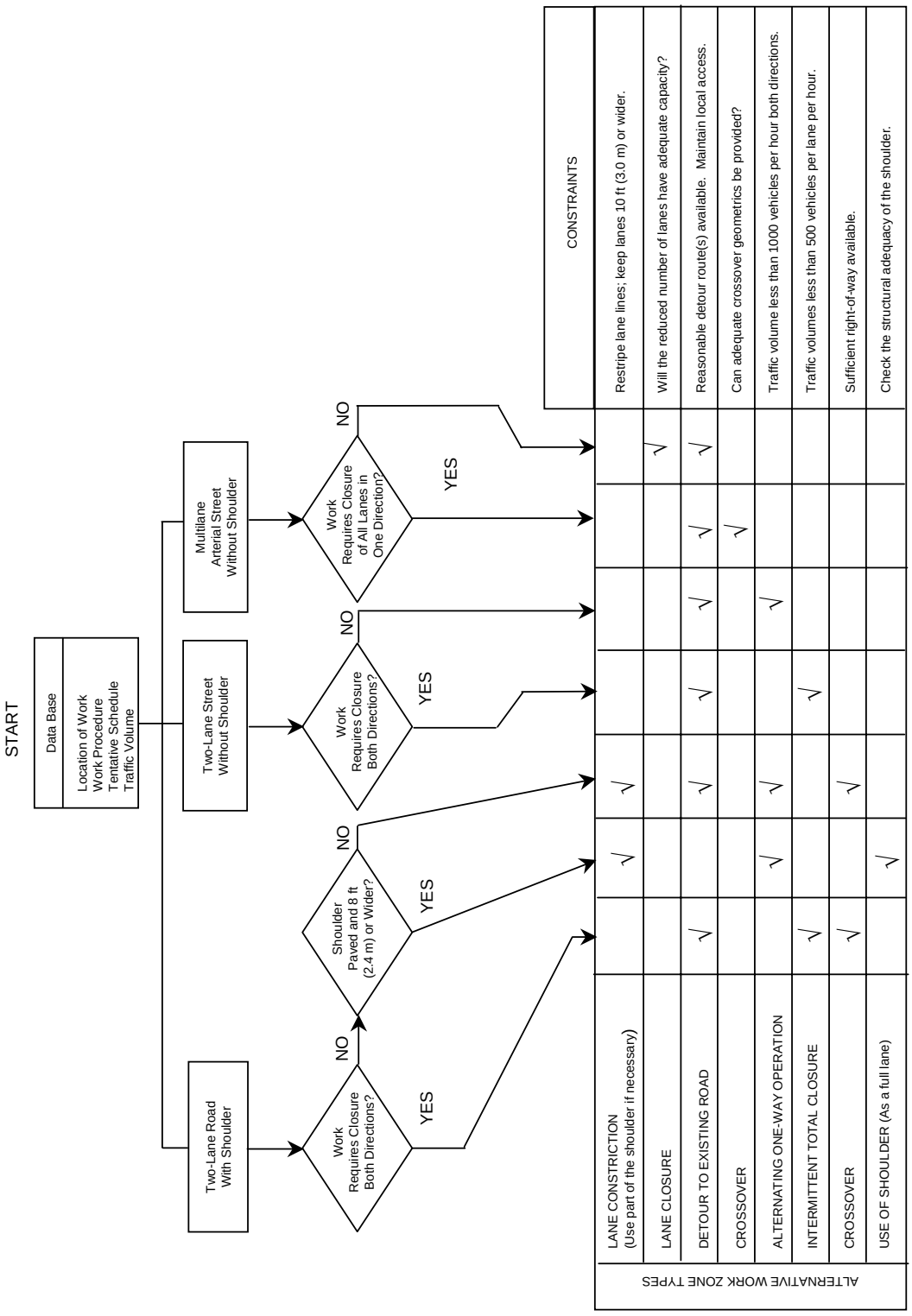
8. Roadway Shifts. This work zone type shifts the proposed roadway alignment laterally, (e.g., 50 ft (15 m), 100 ft (30 m)) so that the existing roadway or bridge can be used as the means to maintain traffic flow at the work site. This is an option that is usually only appropriate at horizontal curve locations, or bridge sites where the roadway profile grade line must be raised for hydraulic purposes. Note that additional right-of-way or easements will often be necessary for this work zone type.

9. Work During Non-Peak Hours. When high-volume projects do not have reasonable alternatives for 3R type work, consider requiring work during non-peak hours and/or night work.

39-5.03(c) Selection

Selection of the appropriate work zone type represents one of the most significant elements of a traffic control strategy. Other elements of a control strategy that should be considered include length of the work zone, time of work, number of lanes, lane widths, traffic speeds, and right-of-way. Considering these and other factors, reasonable alternatives can be narrowed to a selected few for further review. Typically, only a small number of reasonable work zone alternatives will emerge for a particular project and, in many cases, only one may be practical. Identification of these alternatives at an early stage in the planning process can reduce significantly the analysis effort.

Figure 39-5A provides guidelines for identifying practical work zone alternatives based on roadway type, lane closure requirements, shoulder width, traffic volume, and the availability of right-of-way and detour routes. However, every work zone location will have a wide variation of conditions and an all-inclusive selection matrix is not practical. Other issues to consider include the following:



IDENTIFICATION OF FEASIBLE WORK ZONE TYPES

Figure 39-5A

1. Local Regulations. Many jurisdictions have adopted safety regulations and public convenience policies as safeguards against the unacceptable impacts of work zones. These regulations and policies may impose additional constraints regarding the types of control strategies that can be implemented. Knowing these constraints can help eliminate impractical alternatives from consideration. The public convenience policies or local regulations may specify peak-hour restrictions, access requirements, noise level limitations, material storage and handling, excavation procedures, work zone lengths, and number of traffic lanes that must remain open.

2. Multilane Facilities. Traffic on multilane facilities is usually maintained through the use of lane constrictions or lane closures. Maintaining traffic flow on multilane facilities generally will require different criteria than those used on the rural 2-lane highway system because of the higher traffic volumes.

3. Bridges. Traffic maintenance for bridges may consist of stage construction (i.e., partial closure), detours, runarounds, or split detours. Proposed designs may be coordinated with the Bureau of Bridges and Structures to determine their feasibility. In addition, consider the following:

   Stage Construction (Partial Closure). Stage construction for bridges will generally consist of lane constrictions, lane closures, or one-lane, one-way operations. However, stage construction may increase unit costs, increase the difficulty of reconstructing the bridge, have inherent hazards due to close proximity of traffic to the construction operations, and generally involves a restricted lateral clearance for vehicles, wide loads, and farm equipment. With lateral restrictions, it is important that these restrictions be adequately marked in advance of the work site. Consider the following factors when determining the feasibility of stage construction for bridges:

   - type, length, and width of present and new structure;
   - number of beams;
   - beam spacing and location in relation to the desirable staging limits;
   - condition of existing substructure and its ability to accept stage construction;
   - lane and shoulder widths required during stage operations (this may require using the shoulder as part of the lane);
   - the use of temporary traffic signals; and
   - costs attributable to staging.

   Deck repairs can usually be staged for all structure types. Superstructure and deck replacement; however, is sensitive to the type of structure involved. Existing multi-beam superstructures (e.g., steel I-beams, concrete I-beams) and

culverts can usually be adapted to construction staging techniques depending on the number of beams. Other types of structures (e.g., pony trusses, relatively short-span structures utilizing low trusses without cross bracing) may be staged, but with greater difficulty and expense. Some structures (e.g., through trusses, through girders) cannot be staged.

Runarounds. At locations where a through truss, pony truss, or steel through girder is being replaced, consider moving the truss or girder laterally to temporary abutments and using the structure as a part of the runaround.

Split Detours. If significant through traffic is using the road or street, it may be advantageous to provide a marked detour route around the work site and build a low-water runaround across a stream for local access. This option is usually applicable only on low-volume unmarked rural highways with less than 400 vehicles per day. See Chapter 7 for Section 404 permit requirements.

4. Additional Guidance. For additional guidance in analyzing and preparing a scheme to maintain traffic flow at work sites, see the *IDOT Highway Standards*, *ILMUTCD*, *IDOT Standard Specifications*, Chapter 55 of the *BDE Manual*, and Departmental Policy TRA-1 "Traffic Control Through Construction and Maintenance Areas."

39-5.04 Reduced Traffic Control for Roads Closed to Through Traffic

Where a highway or bridge is closed to through traffic, 430 ILCS 105/2 allows a local agency to specify alternative procedures, if desired, for flagging and controlling the local traffic through the work zone. The designer must specify the option for reduced traffic control in the contract documents and provide the average daily local traffic in the contract; otherwise, the contractor will be required to provide the same level of traffic control within the section of road closed to through traffic as would be required for open-highway conditions.

IDOT's criteria in the *IDOT Standard Specifications* for reduced traffic control are based on the expected traffic volumes through the work zone. The designer will be responsible for determining these traffic volumes and incorporating this information within the traffic control plans. The estimated traffic volumes may vary at different locations within the work zone or during separate construction phases. For these situations, list the expected traffic volumes for each location and/or phase. This will allow the contractor to adjust the traffic control accordingly. Note that if no action is taken by the designer, the contractor will be required to provide the same level of traffic control within the section of road closed to through traffic as would be required for open highway conditions.

The following alternative procedures have been approved by IDOT and may be used for local agency projects. These alternative procedures are broken into three traffic ranges through the construction zone exclusive of construction vehicles:

- less than 100 ADT,

- 100 to 400 ADT, and
- over 400 ADT.

Consider the following:

1. Flaggers. The *IDOT Standard Specifications* contains provisions for reducing the number of flaggers required where the road is closed to through traffic but only if the expected ADT is shown on the plans or in the Special Provisions to be less than 400. The *IDOT Standard Specifications* allows the contractor to use only one flagger when the ADT is between 100 and 400 and does not require a flagger when the ADT is below 100, unless the contractor's operation encroaches on the open traffic lane.

2. Traffic Control Devices. Signing within the section closed to through traffic may also be reduced from that shown on the applicable *IDOT Traffic Control Standards* when the designer has determined that reduced traffic control is appropriate. When the estimated ADT will be less than 400, only one advance warning sign will usually be necessary. This sign should display a specific message (e.g., RIGHT LANE CLOSED AHEAD), rather than a general message (e.g., MEN WORKING). The flashing light may be omitted from the advance sign. When the estimated ADT is 400 or more, signing should be provided to full open highway requirements, except that the advance signing may be reduced by omitting the first sign in the normal series (e.g., ROAD CONSTRUCTION AHEAD). Barricades, cones, and other traffic control devices should normally conform to full open highway requirements except that when the operating speed of the traffic within the section closed to through traffic will be less than 45 mph (70 km/h), the following taper rates may be used:

    - 40 mph (60 km/h) – 25:1,
    - 45 mph (70 km/h) – 20:1, or
    - 50 mph (80 km/h) – 15:1.

Special Provisions and/or special details relating to reduced traffic control other than flaggers will have to be developed by the designer on a case-by-case basis and be included in the Traffic Control Plan or the contract plans.

39-5.05 Flaggers

Flaggers must be provided in accordance with the *IDOT Standard Specifications* and any applicable Work Zone Traffic Control Standard. All flaggers engaged in work zone traffic control operations are required to be certified by IDOT, or an agency approved by IDOT.

39-5.06 High-Visibility Safety Apparel

In accordance with OSHA regulations (29 CFR 1926.651(d)) all workers exposed to public vehicular traffic are required to wear ANSI Class 2 garments. The *ILMUTCD* also requires

flaggers to wear safety apparel meeting the ANSI Class 2 standard. The color shall be either fluorescent orange-red or fluorescent yellow-green with retroreflective material being orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors. Local agencies should be aware that OSHA has the authority to cite agencies if employees are not wearing the specified vest when exposed to vehicular traffic.

39-5.07 Highway Signs

39-5.07(a) General

In construction zones, regulatory signs are used to temporarily override an existing mandate or prohibition (e.g., reduced speed limit). Warning signs are used in advance of the construction area to indicate potentially hazardous conditions, and guide signs are used at various locations to inform drivers of detour routes, destinations, and points of interest. The *IDOT Highway Standards*, the *IDOT Standard Specifications*, and the *ILMUTCD* provide the criteria for the design, application, and placement of these signs in construction zones.

39-5.07(b) Speed Limit Signing

Different posted speed limits may apply based on whether the speed limit is within the work zone or if it is within a construction site.

The work zone speed limit will be determined based on the work zone design speed, traffic volumes, construction work type, geometrics, project length, etc. Where there is no lane closure or apparent hazard, maintain the existing speed limit. The speed limit may be reduced from the existing speed limit by 10 mph if an engineering study indicates the reduced speed is necessary. The Work Zone Speed Limit Sign also may be used to reduce the existing speed limit by 10 mph if workers are close to traffic and are not protected by temporary concrete barrier. The need for this sign should be determined by an engineering investigation. The following may be reasons for using the Work Zone Speed Limit Signs:

- narrow pavement lane width,
- high-traffic volumes,
- inadequate sight distance,
- workers on the shoulder, or
- workers in a closed lane adjacent to an open lane.

Note that the work zone speed limit should not exceed the work zone design speed through the construction area.
See the *IDOT Standard Specifications* and *IDOT Highway Standards* for details on sign placement.

39-5.07(c) Guide Signs

The references in Section 39-6 provide the criteria for the design, application, and placement of guide signs. The following provides supplemental information on the use of guide signs in construction zones:

1. Detour Marking. Marked detours should be provided with temporary route markers and destination signs by the local agency in accordance with the *ILMUTCD*.

2. Panel Signs. Guide signs are typically warranted in construction zones and on alternative routes where temporary route changes are necessary. For example, the designer may consider using large panel signs or changeable message signs for detours and closures.

3. Other. Standard route markings, street name signs, special information signs, directional, and detour signs may also be warranted based on the particular work on the facility.

39-5.07(d) Portable Changeable Message Signs

Portable changeable message signs (CMS) are very effective in communicating the construction zone information to the general public. The use of a CMS will be determined on a project-by-project basis based on road alignment, traffic routing, or other situations requiring advance warning and information. The following are some typical applications where the CMS device may be effectively used in construction zones:

- to provide advance notice of upcoming construction;
- where significant traffic queuing and delays are expected;
- where changes in road alignment or surface conditions are present;
- to provide advance notice of lane and road closures;
- to notify or direct motorists to alternative routing; and
- to provide additional information on high-volume, urban projects.

The *ILMUTCD* provides the design and application criteria relative to CMS.

39-5.07(e) Arrow Panels

In some construction areas, arrow panels are used to supplement conventional traffic control devices. They are used as directional information to assist in merging traffic. The *IDOT Highway Standards* and the *ILMUTCD* provide the criteria for the placement, design, and application of arrow boards.

39-5.08 Channelization Devices

The *IDOT Highway Standards*, the *IDOT Standard Specifications*, and the *ILMUTCD* provide the criteria for the selection, application, and placement of channelization devices. The *ILMUTCD* and the *IDOT Highway Standards* also illustrate typical application diagrams for the use of these devices. There are numerous types of channelization devices available, each having its specific application in construction operations (e.g., runarounds, lane closures, road closures, two-way, two-lane (TWTL) operations). The following channelization devices are typically used in construction zones:

1. Barricades:

    a. Type I and Type II Barricades. Type I or Type II barricades may be used for channelization. Type II barricades should be used on high-speed roads.

    b. Type III Barricades. Types III barricades are used for road and lane closures.

2. Drums. Drums are most commonly used in a linear series to channelize traffic.

3. Cones. Traffic cones are channelization devices used only during daylight hours.

4. Tubular Markers/Vertical Panels. These devices are used to channelize traffic, to divide opposing lanes of traffic at posted speeds of 40 mph or less, or in lieu of drums where space is limited and speeds are 40 mph or less. Tubular markers and vertical panels have less visible area than other devices. Therefore, only use these devices where space restrictions do not allow for the use of more visible devices.

5. Temporary Concrete Barriers (TCB). Only use TCB where positive protection is desired; do not use based on channelization needs. If used, locate the TCB behind and in conjunction with other supporting channelization devices, delineators, and/or pavement markings. Delineators, reflectors, and steady-burning lamps should also be attached to the TCB.

6. Delineators. Delineators provide retroreflectivity from headlights and are supplemental devices commonly used to indicate the roadway alignment and the intended path through the construction zone.

These channelization devices are used extensively in work zones to warn drivers of work activities in or near the traveled way, to protect workers in the area, and to guide drivers and pedestrians safely through and around the work zone. Because each construction project differs, the selection, application, and location of these devices should be determined on a project-by-project basis.

39-5.09 Pavement Markings

39-5.09(a) Existing Pavement Markings

Conflicting pavement markings through the work zone area must be obliterated to prevent confusion to vehicles operators. Painting over existing markings is not acceptable.

39-5.09(b) Types of Marking

The *IDOT Highway Standards* and the *ILMUTCD* provide the criteria for the selection, application, and placement of pavement markings in work zones. The *IDOT Standard Specifications* provide additional information on pavement markings. The following Sections provide supplemental guidelines to these sources. The following types of pavement markings are typically used in work zones:

1. Temporary Paint. Quick-drying paint is a low-cost, temporary pavement marking that may be used on construction projects. To improve reflectivity, glass beads are required. In general, do not use temporary paint markings on final pavement surfaces.

2. Temporary Raised Pavement Markers. In high-volume locations, the designer may consider using raised temporary pavement markers as a supplemental device to improve delineation through the work zone. Typical locations include lane lines and areas where there are changes in the alignment (e.g., lane closures, lane shifts). For lane lines, temporary raised pavement markers are placed mid-point in the gap. For tapers, lane transitions, etc., space the raised markers at 20 ft (6 m) intervals. Temporary raised pavement markers must be removed prior to placing the next pavement course.

3. Temporary Pavement Marking Tape. Temporary pavement marking tape is an appropriate material choice where there are changes to the traffic pattern during construction (e.g., lane shifts). Temporary tape can be easily and quickly installed and, when necessary, easily removed. One disadvantage is that this tape tends to move and/or breakup under heavy traffic volumes. Black tape may be used to temporarily remove lane lines.

4. Thermoplastic Markings. Thermoplastic markings are generally used in construction zones only if traffic volumes are high and the traffic pattern will be in place for a long duration (e.g., over one year).

39-5.09(c) Implementation

The application of pavement markings in work zones depends on facility type, project duration, project length, and anticipated traffic volume. Temporary pavement markings and no passing signs are required on all high-type surfaces (i.e. hot-mix asphalt, concrete), except for low-

volume roadways. Temporary pavement markings should also be considered on low-volume roadways.

1. Lane Markings. At the end of each workday, appropriate temporary pavement marking will be installed between all lanes that are open to traffic. Temporary markings will consist of stripes 4 ft (1.2 m) in length at a maximum spacing of 40 ft (12 m) along the centerline of 2-lane highways and the lane lines on multi-lane highways. Centerlines on two lanes will be yellow and lane lines separating two or more lanes of traffic moving in the same direction will be white. All temporary markings on the final wearing surface will be removed within 5 days after the permanent markings are installed, unless otherwise noted in the plans.

2. Edge Markings. When edge lines on multi-lane highways are obliterated due to resurfacing and operation problems are anticipated or are occurring due to the roadway geometrics, volume of traffic, ambient lighting, or narrow bridge, temporary diagonal lines should be placed on the shoulders beginning at the edge of the traveled way or auxiliary lanes at intervals of 50 ft (15 m) on ramps or 200 ft (60 m) on main lines. The markings will be a minimum of 4 in (100 mm) wide and 2 ft (600 mm) long and will be angle away from the direction of traffic at approximately 45°. The color of the diagonal lines will match the color of the pavement edge lines.

3. Permanent Pavement Markings. Temporary pavement markings should be replaced with standard markings as soon as practical. Normally, it should not be necessary to leave temporary markings in place more than two weeks after completion of any intermediate or final surface. The time restriction for installation of full standard pavement markings begins at the completion of each intermediate lift or final lift of the resurfacing project. If roto-milling obliterates the markings, the time restriction begins when the entire surface has been milled. These restrictions may be delayed by the contracting agency whenever the contractor cannot apply markings due to unanticipated inclement weather, other than a winter shutdown on the project, strike activities, or other circumstances beyond their control. The standard markings should be installed as soon as practical after construction activities are resumed. Prior to winter, standard edge lines, lane lines, centerlines, and no-passing zone markings must be installed, at a minimum, on any intermediate or final surface that will remain open to traffic during the winter shutdown period.

4. No Passing Signs. No passing zones on 2-lane and 3-lane roadways may be identified by using either the pennant NO PASSING ZONE warning sign or the DO NOT PASS, PASS WITH CARE regulatory sign rather than pavement markings for periods of time up to 3 calendar days after an intermediate or final lift is competed. Signs may also be used in lieu of pavement markings on low-volume roads until it is practical and possible to install the final full standard markings.

39-5.10 Traffic Signals

39-5.10(a) Location

The use of temporary traffic signals in work zones will be determined on a project-by-project basis. Use the warrant criteria for permanent installations discussed in Section 39-4 to assist in determining if a temporary traffic signal is warranted. However, use the actual traffic volumes expected during construction for the warrant analysis. Common locations where temporary signal installations may be used include the following:

- intersections where an existing signal must be maintained;
- existing non-signalized intersections and driveways where construction patterns and volumes now warrant a signal;
- at a temporary haul road or other temporary access points;
- at crossroad intersections where there is an increase in traffic or there is a decrease in capacity due to the construction; and
- at long-term, 1-lane, 2-way traffic operations (e.g., bridge lane closures).

39-5.10(b) Application

Consider the following:

1. Design. Determine the impacts that a construction activity has on existing signal operations and attempt to maximize the level of service. For example, consider:

    - re-timing or re-phasing the signal to compensate for changes in traffic volume, mix, or patterns, and for changes in lane designations or intersection approach geometrics; or
    - physically relocating poles or adjusting signal heads to maintain compliance with the *ILMUTCD*.

2. Bridges. The *IDOT Highway Standards* require a temporary signal installation for a bridge lane closure. However, in some situations, the use of a flagger may be more cost effective.

39-6 REFERENCES

For information on traffic control device material specifications, design, and application criteria, review the applicable publications listed below:

1. *Illinois Manual on Uniform Traffic Control Devices* (ILMUTCD), IDOT.
2. *Signing of Road District and Township Highways*, BLRS.
3. *Policy on Establishing and Posting Speed Limits*, Bureau of Operations, IDOT.
4. *Tourist Oriented Directional Signing Program (TODS)*, IDOT.
5. *Quality Standard for Work Zone Traffic Control Devices*, Bureau of Operations, IDOT.
6. *Bureau of Operations Traffic Policies and Procedures Manual*, IDOT.
7. *Standard Specifications for Road and Bridge Construction*, IDOT.
8. *Highway Standards*, IDOT.
9. *Standard Highway Signs*, IDOT.
10. *Sign Structures Manual*, IDOT.
11. *A Policy on Geometric Design of Highways and Streets*, AASHTO.
12. *Roadside Design Guide*, AASHTO.
13. *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, AASHTO.
14. *Manual of Steel Construction*, AISC.
15. *Standard Alphabets for Highway Signs and Pavement Markings*, FHWA.
16. *Traffic Engineering Handbook*, ITE.
17. *Manual of Transportation Engineering Studies*, ITE.
18. *Manual of Traffic Signal Design*, ITE.
19. *Equipment and Materials Standards*, ITE.
20. *Preemption of Traffic Signals At Or Near Active Warning Railroad Grade Crossings*, ITE.
21. *Traffic Signal Installation and Maintenance Manual*, ITE.
22. *Traffic Signing Handbook*, ITE.

23. *Traffic Detector Handbook*, FHWA.

24. *Official Wire and Cable Specifications Manual*, IMSA.

25. *Traffic Control Systems*, NEMA.

26. *Traffic Controller Assemblies*, NEMA.

27. *Highway Capacity Manual*, TRB.

28. National, State, and local electrical codes and manufacturer's literature.